

2.22 Climate Change

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the earth's climate system. An ever-increasing body of scientific research attributes these climatological changes to greenhouse gases (GHGs), particularly those generated from the production and use of fossil fuels.

While climate change has been a concern for several decades, the establishment of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations and World Meteorological Organization's in 1988, has led to increased efforts devoted to greenhouse gas (GHG) emissions reduction and climate change research and policy. These efforts are primarily concerned with the emissions of GHGs related to human activity that include carbon dioxide (CO₂), methane, nitrous oxide, tetrafluoromethane, hexafluoroethane, sulfur hexafluoride, HFC-23 (fluoroform), HFC-134a (s, s, s, 2 –tetrafluoroethane), and HFC-152a (difluoroethane).

There are typically two terms used when discussing the impacts of climate change. "Greenhouse Gas (GHG) Mitigation" is a term for reducing GHG emissions in order to reduce or "mitigate" the impacts of climate change. "Adaptation," refers to the effort of planning for and adapting to impacts due to climate change (such as adjusting transportation design standards to withstand more intense storms and higher sea levels)¹.

Transportation sources (passenger cars, light duty trucks, other trucks, buses and motorcycles) in the state of California make up the largest source (second to electricity generation) of greenhouse gas emitting sources. Conversely, the main source of GHG emissions in the United States is electricity generation followed by transportation. The dominant GHG emitted is CO₂, mostly from fossil fuel combustion.

There are four primary strategies for reducing GHG emissions from transportation sources: 1) improve system and operation efficiencies, 2) reduce growth of vehicle miles traveled (VMT) 3) transition to lower GHG fuels and 4) improve vehicle technologies. To be most effective all four should be pursued collectively. The following regulatory setting section outlines state and federal efforts to comprehensively reduce GHG emissions from transportation sources.

¹ http://climatechange.transportation.org/ghg_mitigation/

2.22.1 Regulatory Setting

2.22.1.1 State

With the passage of several pieces of legislation including State Senate and Assembly Bills and Executive Orders, California launched an innovative and pro-active approach to dealing with greenhouse gas emissions and climate change at the state level.

Assembly Bill 1493 (AB 1493), Pavley. Vehicular Emissions: Greenhouse Gases (AB 1493), 2002: requires the California Air Resources Board (CARB) to develop and implement regulations to reduce automobile and light truck greenhouse gas emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with the 2009-model year. In June 2009, the EPA Administrator granted a Clean Air Act waiver of preemption to California. This waiver allowed California to implement its own GHG emission standards for motor vehicles beginning with model year 2009. California agencies will be working with Federal agencies to conduct joint rulemaking to reduce GHG emissions for passenger cars model years 2017-2025.

Executive Order S-3-05: (signed on June 1, 2005, by Governor Arnold Schwarzenegger) the goal of this Executive Order is to reduce California's GHG emissions to: 1) 2000 levels by 2010, 2) 1990 levels by the 2020 and 3) 80 percent below the 1990 levels by the year 2050. In 2006, this goal was further reinforced with the passage of Assembly Bill 32

AB32 (AB 32), the Global Warming Solutions Act of 2006: AB 32 sets the same overall GHG emissions reduction goals as outlined in Executive Order S-3-05, while further mandating that CARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Executive Order S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the State's Climate Action Team.

Executive Order S-01-07: Governor Schwarzenegger set forth the low carbon fuel standard for California. Under this Executive Order, the carbon intensity of California's transportation fuels is to be reduced by at least ten percent by 2020.

Senate Bill 97 (Chapter 185, 2007): required the Governor's Office of Planning and Research (OPR) to develop recommended amendments to the State CEQA

Guidelines for addressing greenhouse gas emissions. The Amendments became effective on March 18, 2010.

2.22.1.2 Federal

Although climate change and GHG reduction is a concern at the federal level; currently there are , no regulations or legislation that have been enacted specifically addressing GHG emissions reductions and climate change at the project level. Climate change and its associated effects are being addressed through various efforts at the federal level to improve fuel economy and energy efficiency, such as the “National Clean Car Program” and Executive Order 13514- *Federal Leadership in Environmental, Energy and Economic Performance*.

Executive Order 13514 is focused on reducing greenhouse gases internally in federal agency missions, programs and operations, but also direct federal agencies to participate in the interagency Climate Change Adaptation Task Force, which is engaged in developing a U.S. strategy for adaptation to climate change.

On April 2, 2007, in *Massachusetts v. EPA*, 549 U.S. 497 (2007), the Supreme Court found that greenhouse gases are air pollutants covered by the Clean Air Act and that the EPA has the authority to regulate GHG. The Court held that the EPA Administrator must determine whether or not emissions of greenhouse gases from new motor vehicles cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision.

On December 7, 2009, the EPA Administrator signed two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act:

- Endangerment Finding: The Administrator found that the current and projected concentrations of the six key well-mixed greenhouse gases-- carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆)--in the atmosphere threaten the public health and welfare of current and future generations.
- Cause or Contribute Finding: The Administrator found that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

Although these findings did not themselves impose any requirements on industry or other entities, this action was a prerequisite to finalizing the USEPA's *Proposed Greenhouse Gas Emission Standards for Light-Duty Vehicles*, which was published on September 15, 2009¹. On May 7, 2010 the final *Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards* was published in the Federal Register.

USEPA and the National Highway Traffic Safety Administration (NHTSA) are taking coordinated steps to enable the production of a new generation of clean vehicles with reduced GHG emissions and improved fuel efficiency from on-road vehicles and engines. These next steps include developing the first-ever GHG regulations for heavy-duty engines and vehicles, as well as additional light-duty vehicle GHG regulations. These steps were outlined by President Obama in a memorandum on May 21, 2010².

The final combined USEPA and NHTSA standards that make up the first phase of this national program apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. The standards require these vehicles to meet an estimated combined average emissions level of 250 grams of carbon dioxide per mile, equivalent to 35.5 miles per gallon (MPG) if the automobile industry were to meet this carbon dioxide level solely through fuel economy improvements. Together, these standards will cut GHG emissions by an estimated 960 million metric tons and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program (model years 2012-2016).

On January 24, 2011, the USEPA along with the U.S. Department of Transportation and the State of California announced a single timeframe for proposing fuel economy and greenhouse gas standards for model years 2017-2025 cars and light-trucks. Proposing the new standards in the same timeframe (September 1, 2011) signals continued collaboration that could lead to an extension of the current National Clean Car Program.

2.22.1.3 Project Analysis

An individual project does not generate enough GHG emissions to significantly influence global climate change. Rather, global climate change is a cumulative impact. This means that a project may participate in a potential impact through its

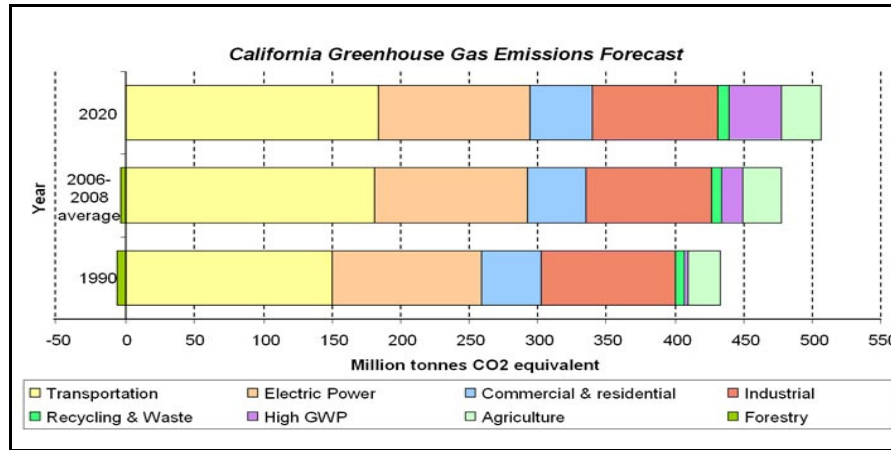
¹ <http://www.epa.gov/climatechange/endangerment.html>

² <http://epa.gov/otaq/climate/regulations.htm>

incremental contribution combined with the contributions of all other sources of GHG.¹ In assessing cumulative impacts, it must be determined if a project's incremental effect is "cumulatively considerable." See CEQA Guidelines sections 15064(h)(1) and 15130. To make this determination the incremental impacts of the project must be compared with the effects of past, current, and probable future projects. To gather sufficient information on a global scale of all past, current, and future projects in order to make this determination is a difficult if not impossible task.

The AB 32 Scoping Plan contains the main strategies California will use to reduce GHG. As part of its supporting documentation for the Draft Scoping Plan, CARB released the GHG inventory for California (Forecast last updated: 28 October 2010). The forecast is an estimate of the emissions expected to occur in the year 2020 if none of the foreseeable measures included in the Scoping Plan were implemented. The base year used for forecasting emissions is the average of statewide emissions in the GHG inventory for 2006, 2007, and 2008.

Figure 2.22-1 California GHG Forecast



Source: <http://www.arb.ca.gov/cc/inventory/data/forecast.htm>

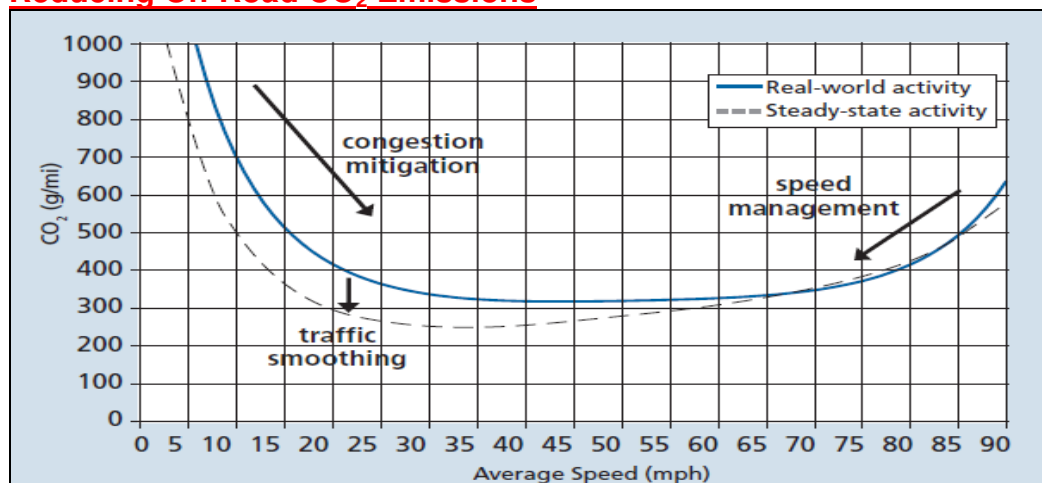
¹ This approach is supported by the AEP: *Recommendations by the Association of Environmental Professionals on How to Analyze GHG Emissions and Global Climate Change in CEQA Documents* (March 5, 2007), as well as the SCAQMD (Chapter 6: : The CEQA Guide, April 2011) and the US Forest Service (Climate Change Considerations in Project Level NEPA Analysis, July 13, 2009).

Caltrans and its parent agency, the Business, Transportation, and Housing Agency, have taken an active role in addressing GHG emission reduction and climate change. Recognizing that 98 percent of California's GHG emissions are from the burning of fossil fuels and 40 percent of all human made GHG emissions are from transportation Caltrans has created and is implementing the Climate Action Program at Caltrans that was published in December 2006 (see Climate Action Program at Caltrans (December 2006)).¹

2.22.2 Environmental Consequences

One of the main strategies in the Caltrans Climate Action Program to reduce GHG emissions is to make California's transportation system more efficient. The highest levels of CO₂ from mobile sources such as automobiles occur at stop-and-go speeds (0–25 miles per hour [mph]) and speeds over 55 mph; the most severe emissions occur from 0–25 mph (refer to Figure 2.22-2). To the extent that a project relieves congestion by enhancing operations and improving travel times in high congestion travel corridors, GHG emissions, particularly CO₂, may be reduced.

Figure 2.22-2 Possible Effect of Traffic Operation Strategies in Reducing On-Road CO₂ Emissions



The purpose of the proposed project is to improve existing and future traffic operations on I-5 from San Juan Creek Road to Avenida Pico while minimizing environmental and economic impacts. Without the proposed project, the

¹ Caltrans Climate Action Program is located at the following web address:
http://www.dot.ca.gov/hq/tpp/offices/ogm/key_reports_files/State_Wide_Strategy/Caltrans_Climate_Action_Program.pdf

efficiency of the regional HOV system will be reduced because HOV traffic will be required to merge into mixed-flow traffic lanes. Delay in completion of this project will contribute to traffic congestion on I-5 within the Cities of San Clemente, Dana Point, and San Juan Capistrano. The proposed project would not generate new vehicular traffic trips since it would not result in the construction of new homes or businesses. The project may, however, attract some traffic currently utilizing other routes to the improved facility, thus resulting in a slight increase in VMT. A focused traffic analysis was prepared to estimate the impact that the proposed project would have on regional VMT and regional VHT. Since the impact of GHG emissions is a global rather than a local issue, the impact of the proposed project on GHG emissions was calculated using regional traffic data. The potential impacts of the project alternative are presented below.

2.22.2.1 Project Alternative Impacts

Build Alternative 4 with Design Option A (Preferred Alternative)

Based on the traffic data provided by Austin-Foust Associates (I-5 HOV Lane Extension PA/ED Traffic Study, May 2010), the ADT along the project portion of I-5 would range from 192,000 to 241,000 during the Existing conditions, 246,000 to 300,000 during the No Build scenario, and 254,000 to 300,000 during the Build scenario. As a result, daily VMT would be 6,898,316.8 during the Existing conditions, 10,809,078.8 during the No Build scenario, and 10,810,373.6 during the Build scenario. As shown in Table 2.22-1, implementation of the proposed project would result in a net increase of VMT by 1,294.8. When compared to the future no-build alternative, an increase of VMT would occur with the future ***Build Alternative 4*** within the HOV lanes, while the freeways, toll roads, ramps, and arterials would experience a VMT decrease.

Table 2.22-1 Vehicle Miles Traveled Summary

Roadways	Scenario			2040 Difference
	Existing	2040 No Build	2040 Build	
Freeways, toll roads, and ramps	4,209,295.8	6,244,871.9	6,148,444.0	-96,427.9
High-occupancy vehicle lanes	358,107.9	570,444.7	674,662.6	104,217.9
Arterials	2,330,913.1	3,993,762.2	3,987,267.0	-6,495.2
Total	6,898,316.8	10,809,078.8	10,810,373.6	1,294.8

Source: RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

Table 2.22-2 compares the future VHT between the No Build and Build scenario. VHT represents the total number of hours spent traveling in vehicles. As shown in Table 2.22-2, implementation of the future build scenario would result in an overall decrease in VHT. Although the VHT would increase for the HOV lanes, the freeways, toll roads, ramps, and arterials would experience a VHT decrease. The HOV lane system is used as a strategy to maximize the people-carrying capacity of the freeways. Therefore, the net reduction in VHT can be attributed to the increase in HOV trips and a reduction in single-occupancy vehicle trips.

Table 2.22-2 Vehicle Hours Traveled Summary

Roadways	Scenario			2040 Difference
	Existing	2040 No Build	2040 Build	
Freeways, toll roads, and ramps	66,816.9	99,328.4	97,866.6	-1,461.8
High-occupancy vehicle lanes	5,516.8	8,788.8	9,798.9	1,010.1
Arterials	653,19.3	111,656.3	111,489.0	-167.3
Total	137,653.0	219,773.5	219,154.5	-619.0

Source: RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

Table 2.22-3 depicts the estimated existing and 2040 emissions from vehicles traveling within the project limits, assuming an average vehicle speed of 65 mph. (Refer to Appendix C of the Air Quality Report [EMFAC Model Run], for the emissions factors used to calculate the proposed project's GHG emissions.) The existing VMT data would result in 3,002.68 metric tons of carbon dioxide equivalent per year (MTCO₂/yr), the 2040 No Build VMT data would result in 4,704.95 MTCO₂/yr, while emissions based on 2040 Build VMT data would result in 4,705.58 MTCO₂/yr. Although [the 2040 Build Alternative 4 with Design Option A](#) conditions would result in a net increase of 0.63 MTCO₂/yr over No Build conditions, it should be noted that the CT-EMFAC model run does not account for the improved traffic flow conditions that would occur under 2040 Build condition. The proposed project would provide continuity of the I-5 mainline HOV network and maximize overall performance within the project limits. Extending the HOV lane would maintain travel speeds, partially due to the fact that weaving conflicts that occur at the termini of the HOV lanes will be minimized.

Table 2.22-3 Annual Greenhouse Gas Emissions

Scenario	CO ₂ ¹ (metric tons/year)
Existing	3,002.68
2040 No Build	4,704.95
2040 Build	4,705.58
2040 Net Change	0.63

Source: RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

¹ Emissions calculated using CT-EMFAC.

CO₂ = carbon dioxide

Limitations and Uncertainties with Modeling

EMFAC

Although EMFAC can calculate CO₂ emissions from mobile sources, the model does have limitations when it comes to accurately reflecting CO₂ emissions. According to the National Cooperative Highway Research Program report, *Development of a Comprehensive Modal Emission Model* (April 2008), studies have revealed that brief but rapid accelerations can contribute significantly to a vehicle's carbon monoxide and hydrocarbon emissions during a typical urban trip. Current emission-factor models are insensitive to the distribution of such modal events (i.e., cruise, acceleration, deceleration, and idle) in the operation of a vehicle and instead estimate emissions by average trip speed. This limitation creates an uncertainty in the model's results when compared to the estimated emissions of the various alternatives with baseline in an attempt to determine impacts. Although work by EPA and the CARB is underway on modal-emission models, neither agency has yet approved a modal emissions model that can be used to conduct this more accurate modeling. In addition, EMFAC does not include speed corrections for most vehicle classes for CO₂ – for most vehicle classes emission factors are held constant which means that EMFAC is not sensitive to the decreased emissions associated with improved traffic flows for most vehicle classes. Therefore, unless a project involves a large number of heavy-duty vehicles, the difference in modeled CO₂ emissions due to speed change will be slight.

It is interesting to note that CARB is currently not using EMFAC to create its inventory of GHG emissions. It is unclear why the CARB has made this decision. Their website only states:

REVISION: Both the EMFAC and OFFROAD Models develop CO₂ and CH₄ [methane] emission estimates; however, they are not currently used as the basis for [CARB's] official [greenhouse gas] inventory which is based on fuel usage information. . . However, ARB is working towards reconciling the emission estimates from the fuel usage approach and the models.

Other Variables

With the current science, project-level analysis of greenhouse gas emissions is limited. Although a greenhouse gas analysis is included for this project, there are numerous key greenhouse gas variables that are likely to change dramatically during the design life of the proposed project and would thus dramatically change the projected CO₂ emissions.

First, vehicle fuel economy is increasing. The EPA's annual report, "Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2008 (<http://www.epa.gov/oms/fetrends.htm>)," which provides data on the fuel economy and technology characteristics of new light-duty vehicles including cars, minivans, sport utility vehicles, and pickup trucks, confirms that average fuel economy has improved each year beginning in 2005, and is now the highest since 1993. Most of the increase since 2004 is due to higher fuel economy for light trucks, following a long-term trend of slightly declining overall fuel economy that peaked in 1987. These vehicles also have a slightly lower market share, peaking at 52 percent in 2004 with projections at 48 percent in 2008.

Table 2.22-4 shows the alternatives for vehicle fuel economy increases studied

Table 2.22-4 Model Year 2015 Required Miles Per Gallon (mpg) by Alternative

No Action		25% Below Optimized	Optimized (Preferred)	25% Above Optimized	50% Above Optimized	Total Costs Equal Total Benefits	Technology Exhaustion
Cars	27.5	33.9	35.7	37.5	39.5	43.3	52.6
Trucks	23.5	27.5	28.6	29.8	30.9	33.1	34.7

by the National Highway Traffic Safety Administration in its Final EIS for New Corporate Average Fuel Economy (CAFE) Standards (October 2008).

Second, near zero carbon vehicles will come into the market during the design life of this project. According to a March 2008 report released by University of California Davis (UC Davis), Institute of Transportation Studies:

“Large advancements have occurred in fuel cell vehicle and hydrogen infrastructure technology over the past 15 years. Fuel cell technology has progressed substantially resulting in power density, efficiency, range, cost, and durability all improving each year. In another sign of progress, automotive developers are now demonstrating over 100 fuel cell vehicles (FCVs) in California – several in the hands of the general public – with configurations designed to be attractive to buyers. Cold-weather operation and vehicle range challenges are close to being solved, although vehicle cost and durability improvements are required before a commercial vehicle can be successful without incentives. The pace of development is on track to approach pre-commercialization within the next decade.

“A number of the U.S. DOE 2010 milestones for FCV development and commercialization are expected to be met by 2010. Accounting for a five to six year production development cycle, the scenarios developed by the U.S. DOE suggest that 10,000s of vehicles per year from 2015 to 2017 would be possible in a federal demonstration program, assuming large cost share grants by the government and industry are available to reduce the cost of production vehicles.”¹

Third and as previously stated, California has recently adopted a low-carbon transportation fuel standard. CARB is scheduled to come out with draft regulations for low carbon fuels in late 2008 with implementation of the standard to begin in 2010.

Fourth, driver behavior has been changing as the U.S. economy and oil prices have changed. In its January 2008 report, “Effects of Gasoline Prices on Driving Behavior and Vehicle Market,” (<http://www.cbo.gov/ftpdocs/88xx/doc8893/01-14-GasolinePrices.pdf>) the Congressional Budget Office found the following results based on data collected from California: 1) freeway motorists have adjusted to higher gas prices by making fewer trips and driving more slowly; 2) the market share of sports utility vehicles is declining; and 3) the average prices for larger, less-fuel-efficient models have declined over the past five

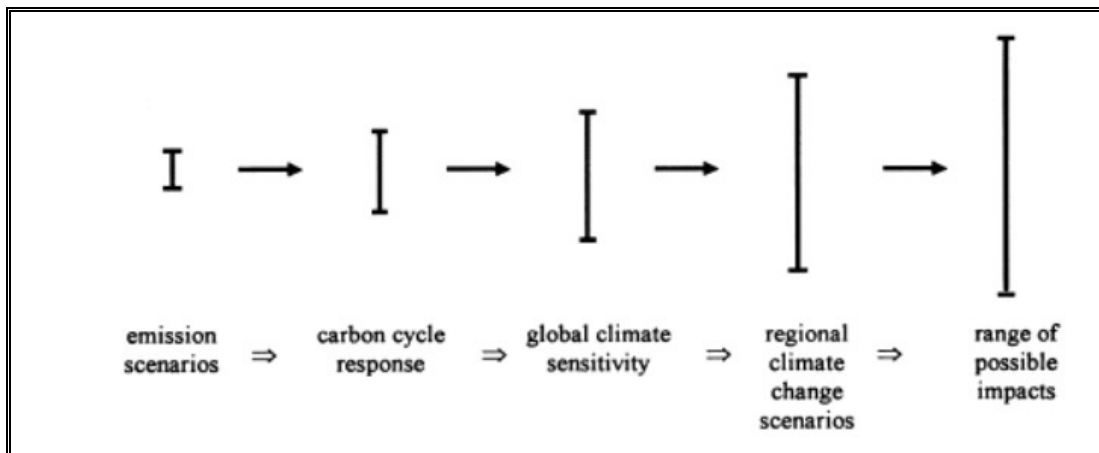
¹ Cunningham, Joshua, Sig Cronich, Michael A. Nicholas. March 2008. Why Hydrogen and Fuel Cells are Needed to Support California Climate Policy, UC Davis, Institute of Transportation Studies, pp. 9-10.

years as average prices for the most-fuel-efficient automobiles have risen, showing an increase in demand for the more fuel efficient vehicles.

Limitations and Uncertainties with Impact Assessment

Taken from p. 3-70 of the National Highway Traffic Safety Administration Final EIS for New CAFE Standards (October 2008), Figure 2.22-3 illustrates how the range of uncertainties in assessing greenhouse gas impacts grows with each step of the analysis:

Figure 2.22-3 Cascade of Uncertainties



“Cascade of uncertainties typical in impact assessments showing the “uncertainty explosion” as these ranges are multiplied to encompass a comprehensive range of future consequences, including physical, economic, social, and political impacts and policy responses.”

Much of the uncertainty in assessing an individual project’s impact on climate change surrounds the global nature of the climate change. Even assuming that the target of meeting the 1990 levels of emissions is met, there is no regulatory or other framework in place that would allow for a ready assessment of what any modeled increase in CO₂ emissions would mean for climate change given the overall California greenhouse gas emissions inventory of approximately 430 million tons of CO₂ equivalent. This uncertainty only increases when viewed globally. The IPCC has created multiple scenarios to project potential future global greenhouse gas emissions as well as to evaluate potential changes in global temperature, other climate changes, and their effect on human and natural systems. These scenarios vary in terms of the type of economic development, the amount of overall growth,

and the steps taken to reduce greenhouse gas emissions. Non-mitigation IPCC scenarios project an increase in global greenhouse gas emissions by 9.7 up to 36.7 billion metric tons CO₂ from 2000 to 2030, which represents an increase of between 25 and 90 percent.¹

The assessment is further complicated by the fact that changes in greenhouse gas emissions can be difficult to attribute to a particular project because the projects often cause shifts in the locale for some type of greenhouse gas emissions, rather than causing “new” greenhouse gas emissions. It is difficult to assess the extent to which any project level increase in CO₂ emissions represents a net global increase, reduction, or no change; there are no models approved by regulatory agencies that operate at the global or even statewide scale.

The complexities and uncertainties associated with project level impact analysis are further borne out in the recently released Final EIS completed by the National Highway Traffic Safety Administration CAFE Standards, October 2008. As the text quoted below shows, even when dealing with greenhouse gas emission scenarios on a national scale for the entire passenger car and light truck fleet, the numerical differences among alternatives is very small and well within the error sensitivity of the model.

“In analyzing across the CAFE 30 alternatives, the mean change in the global mean surface temperature, as a ratio of the increase in warming between the B1 (low) to A1B (medium) scenarios, ranges from 0.5 percent to 1.1 percent. The resulting change in sea level rise (compared to the No Action Alternative) ranges, across the alternatives, from 0.04 centimeter to 0.07 centimeter. In summary, the impacts of the model year 2011-2015 CAFE alternatives on global mean surface temperature, sea level rise, and precipitation are relatively small in the context of the expected changes associated with the emission trajectories. This is due primarily to the global and multi-sectoral nature of the climate problem. Emissions of CO₂, the primary gas driving the climate effects, from the United States automobile and light truck fleet represented about 2.5 percent of total global emissions of all greenhouse gases in the year 2000 (EPA, 2008; CAIT, 2008). While a significant source, this is a still small percentage of global emissions, and the

¹ Intergovernmental Panel on Climate Change (IPCC). February 2007. Climate Change 2007: The Physical Science Basis: Summary for Policy Makers. <http://www.ipcc.ch/SPM2feb07.pdf>.

relative contribution of CO₂ emissions from the United States light vehicle fleet is expected to decline in the future, due primarily to rapid growth of emissions from developing economies (which are due in part to growth in global transportation sector emissions).” [NHTSA Draft EIS for New CAFE Standards, June 2008, pp.3-77 to 3-78]

Construction Emissions

GHG emissions for transportation projects can be divided into those produced during construction and those produced during operations. Construction GHG emissions include emissions produced as a result of material processing, on-site construction equipment, and traffic delays due to construction. These emissions would be produced at different levels throughout the construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during construction phases. In addition, with innovations such as increasing pavement durability, improved traffic management plans, and changes in materials, the GHG emissions produced during construction can be mitigated to some degree by longer intervals between maintenance and rehabilitation events. The proposed project would comply with any State, federal, and/or local rules and regulations developed as a result of implementing control and mitigation measures proposed as part of their respective SIPs.

CEQA Conclusion

As discussed above, both the future with project and future no build show increases in CO₂ emissions and the future build CO₂ emissions are higher than the future no build emissions. In addition, as discussed above, there are also limitations with EMFAC and with assessing what a given CO₂ emissions increase means for climate change. Therefore, it is the Department's determination that in the absence of further regulatory or scientific information related to GHG emissions and CEQA significance, it is too speculative to make a determination regarding significance of the project's direct impact and its contribution on the cumulative scale to climate change. However, the Department is firmly committed to implementing measures to help reduce the potential effects of the project. These measures are outlined in the following section.

Assembly Bill 32 Compliance

The Department continues to be actively involved on the Governor's Climate Action Team as CARB works to implement the Governor's Executive Orders and

help achieve the targets set forth in AB 32. Many of the strategies the Department is using to help meet the targets in AB 32 come from the California Strategic Growth Plan, which is updated each year. Governor Arnold Schwarzenegger's Strategic Growth Plan calls for a \$222 billion infrastructure improvement program to fortify the state's transportation system, education, housing, and waterways, including \$100.7 billion in transportation funding during the next decade.

The Strategic Growth Plan targets a significant decrease in traffic congestion below today's level and a corresponding reduction in GHG emissions. The Strategic Growth Plan proposes to do this while accommodating growth in population and the economy. A suite of investment options has been created that combined together yield the promised reduction in congestion. The Strategic Growth Plan relies on a complete systems approach to attain CO₂ reduction goals: system monitoring and evaluation, maintenance and preservation, smart land use and demand management, and operational improvements as depicted in Figure 2.22-4: The Mobility Pyramid.

Figure 2.22-4 Mobility Pyramid



The Department is supporting efforts to reduce vehicle miles traveled by planning and implementing smart land use strategies: job/housing proximity, developing transit-oriented communities, and high density housing along transit corridors. The Department is working closely with local jurisdictions on planning activities; however, the Department does not have local land use planning authority. The Department is also supporting efforts to improve the energy efficiency of the transportation sector by increasing vehicle fuel economy in new cars, light and heavy-duty trucks; the Department is doing this by supporting on-going research efforts at universities, by supporting legislative efforts to increase fuel economy, and by its participation on the Climate Action Team. It is important to note, however, that the control of the fuel economy standards is held by U.S. EPA and CARB. Lastly, the use of alternative fuels is also being considered; the Department is participating in funding for alternative fuel research at the UC Davis.

Table 2.22-5 summarizes the Department and statewide efforts that it is implementing in order to reduce GHG emissions. More detailed information about each strategy is included in the Climate Action Program at Caltrans (December 2006).

Table 2.22-5 Department Climate Change Strategies

Strategy	Program	Partnership		Method/Process	Estimated CO ₂ Savings (MMT)	
		Lead	Agency		2010	2020
Smart Land Use	Intergovernmental Review (IGR)	Department	Local Governments	Review and seek to mitigate development proposals	Not Estimated	Not Estimated
	Planning Grants	Department	Local and regional agencies and other stakeholders	Competitive selection process	Not Estimated	Not Estimated
	Regional Plans and Blueprint Planning	Regional Agencies	Department	Regional plans and application process	0.975	7.8
Operational Improvements and ITS Deployment	Strategic Growth Plan	Department	Regions	State ITS; Congestion Management Plan	0.007	2.17
Mainstream Energy and GHG into Plans and Projects	Office of Policy Analysis and Research; Division of Environmental Analysis	Interdepartmental effort		Policy establishment, guidelines, technical assistance	Not Estimated	Not Estimated
Educational and Information Program	Office of Policy Analysis and Research	Interdepartmental, Cal EPA, CARB, CEC		Analytical report, data collection, publication, workshops, outreach	Not Estimated	Not Estimated
Fleet Greening and Fuel Diversification	Division of Equipment	Department of General Services		Fleet Replacement B20 B100	0.0045	0.0065 0.45 0.0225
Non-vehicular Conservation Measures	Energy Conservation Program	Green Action Team		Energy Conservation Opportunities	0.117	0.34
Portland Cement	Office of Rigid Pavement	Cement and Construction Industries		2.5 % limestone cement mix 25% fly ash cement mix > 50% fly ash/slag mix	1.2 .36	3.6
Goods Movement	Office of Goods Movement	Cal EPA, CARB, BT&H, MPOs		Goods Movement Action Plan	Not Estimated	Not Estimated
Total					2.66	18.67

Source: RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

BT&H = Business, Transportation & Housing Agency

Cal EPA = California Environmental Protection Agency

CARB = California Air Resources Board

CEC = California Energy Commission

ITS = Intelligent Transportation Systems

MMT = million metric tons

MPO = Metropolitan Planning Organization

To the extent that it is applicable or feasible for the project and through coordination with the project development team, the following measures will also be included in the project to reduce the GHG emissions and potential climate change impacts from the project:

1. The Department and the California Highway Patrol are working with regional agencies to implement Intelligent Transportation Systems (ITS) to help manage the efficiency of the existing highway system. ITS is commonly referred to as electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.
2. In addition, the OCTA provides ridesharing services and park-and-ride facilities to help manage the growth in demand for highway capacity.
3. The project would incorporate the use of energy efficient lighting, such as LED traffic signals. LED bulbs cost \$60 to \$70 apiece but last five to six years, compared to the one-year average lifespan of the incandescent bulbs previously used. The LED bulbs themselves consume 10 percent of the electricity of traditional lights, which will also help reduce the projects CO₂ emissions.¹
4. According to Caltrans Standard Specifications, the contractor must comply with all local Air Pollution Control District's rules, ordinances, and regulations in regards to air quality restrictions.

¹ [Knoxville Business Journal, "LED Lights Pay for Themselves," May 19, 2008 at http://www.knoxnews.com/news/2008/may/19/led-traffic-lights-pay-themselves/](http://www.knoxnews.com/news/2008/may/19/led-traffic-lights-pay-themselves/)

Adaptation Strategies

“Adaptation strategies” refer to how the Department and others can plan for the effects of climate change on the State’s transportation infrastructure and strengthen or protect the facilities from damage. Climate change is expected to produce increased variability in precipitation, rising temperatures, rising sea levels, storm surges and intensity, and the frequency and intensity of wildfires. These changes may affect the transportation infrastructure in various ways, such as damaging roadbeds by longer periods of intense heat; increasing storm damage from flooding and erosion; and inundation from rising sea levels. These effects vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. There may also be economic and strategic ramifications as a result of these types of impacts to the transportation infrastructure.

At the Federal level, the Climate Change Adaptation Task Force, co-chaired by the White House Council on Environmental Quality (CEQ), the Office of Science and Technology Policy (OSTP), and the National Oceanic and Atmospheric Administration (NOAA), released its interagency report October 14, 2010 outlining recommendations to President Obama for how Federal Agency policies and programs can better prepare the United States to respond to the impacts of climate change. The Progress Report of the Interagency Climate Change Adaptation Task Force recommends that the Federal Government implement actions to expand and strengthen the Nation’s capacity to better understand, prepare for, and respond to climate change.

Climate change adaptation must also involve the natural environment as well. Efforts are underway on a statewide-level to develop strategies to cope with impacts to habitat and biodiversity through planning and conservation. The results of these efforts help California agencies plan and implement mitigation strategies for programs and projects.

On November 14, 2008, Governor Schwarzenegger signed EO S-13-08, which directed a number of State agencies to address California’s vulnerability to sea level rise caused by climate change.

The Natural Resources Agency (Resources Agency), through the interagency Climate Action Team, was directed to coordinate with local, regional, State, and federal public and private entities to develop a State Climate Adaptation Strategy. The Climate Adaptation Strategy will summarize the best known science on climate

change impacts to California, assesses California's vulnerability to the identified impacts and then outlines solutions that can be implemented within and across State agencies to promote resiliency.

The strategy outline is in direct response to Executive Order S-13-08 that specifically asked the Resources Agency to identify how state agencies can respond to rising temperatures, changing precipitation patterns, sea level rise, and extreme natural events. Numerous other state agencies were involved in the creation of the Adaptation Strategy document, including Environmental Protection; Business, Transportation and Housing; Health and Human Services; and the Department of Agriculture. The document is broken down into strategies for different sectors that include: Public Health; Biodiversity and Habitat; Ocean and Coastal Resources; Water Management; Agriculture; Forestry; and Transportation and Energy Infrastructure. As data continues to be developed and collected, the state's adaptation strategy will be updated to reflect current findings.

As part of its development of the Climate Adaptation Strategy, the Resources Agency was directed to request the National Academy of Science to prepare a *Sea Level Rise Assessment Report* by December 2010¹ to advise how California should plan for future sea level rise. The report is to include:

- Relative sea level rise projections for California, taking into account coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge, and land subsidence rates
- The range of uncertainty in selected sea level rise projections
- A synthesis of existing information on projected sea level rise impacts to State infrastructure (such as roads, public facilities, and beaches), natural areas, and coastal and marine ecosystems
- A discussion of future research needs regarding sea level rise for California

Prior to the release of the final Sea Level Rise Assessment Report, all state agencies that are planning to construct projects in areas vulnerable to future sea level rise were directed to consider a range of sea level rise scenarios for the years 2050 and 2100 in order to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. Sea level rise estimates should also be used in conjunction with information regarding local uplift and

¹ The Sea Level Rise Assessment report is currently due to be completed in 2012 and will include information for Oregon and Washington State as well as California.

subsidence, coastal erosion rates, predicted higher high water levels, storm surge and storm wave data.

Until the final report from the National Academy of Sciences is released, interim guidance has been released by The Coastal Ocean Climate Action Team (CO-CAT) as well as Caltrans as a method to initiate action and discussion of potential risks to the states infrastructure due to projected sea level rise.

All projects that have filed a Notice of Preparation, and/or are programmed for construction funding from 2008 through 2013, or are routine maintenance projects as of the date of Executive Order S-13-08 may, but are not required to, consider these planning guidelines.

Furthermore, EO S-13-08 directed the Business, Transportation, and Housing Agency to prepare a report to assess the vulnerability of transportation systems to sea level rise, affecting safety, maintenance, and operational improvements of the system and economy of the State. The Department continues to work on assessing the transportation system vulnerability to climate change, including the effect of sea level rise.

Currently, the Department is working to assess which transportation facilities are at greatest risk from climate change effects. However, without statewide planning scenarios for relative sea level rise and other climate change impacts, the Department has not been able to determine what change, if any, may be made to its design standards for its transportation facilities. Once statewide planning scenarios become available, the Department will be able review its current design standards to determine what changes, if any, may be warranted in order to protect the transportation system from sea level rise.

Climate change adaptation for transportation infrastructure involves long-term planning and risk management to address vulnerabilities in the transportation system from increased precipitation and flooding; the increased frequency and intensity of storms and wildfires; rising temperatures; and rising sea levels. The Department is an active participant in the efforts being conducted in response to Executive Order S-13-08 and is mobilizing to be able to respond to the National Academy of Science report on Sea Level Rise Assessment which is due to be released in 2012.

According to the IPCC report, *Climate Change 2007: The Physical Science Basis: Summary for Policymakers* (February 2007), there is no doubt that the climate system is warming. Global average air and ocean temperatures as well as global average sea level are rising. Of the 12 years preceding 2007, 11 years have ranked as among the warmest on record since 1850. While some of the increase is explained by natural occurrences, the 2007 report asserts that the increase in temperatures is very likely (> 90 percent) due to human activity, most notably the burning of fossil fuels. For California, similar effects are described in the California Climate Change Center report, *Our Changing Climate: Assessing the Risks to California* (July 2006). Based on projections using state-of-the-art climate modeling, the temperatures in California are expected to rise between three °F to 10.5°F by the end of the century, depending on how much California is able to reduce its GHG emissions. Changes to the global climate system and ecosystems and to California would include, but would not be limited to:

- The loss of sea ice and mountain snow pack, resulting in higher sea levels and higher sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures.¹
- Rise in global average sea level primarily due to thermal expansion and melting of glaciers, ice caps, and the Greenland and Antarctic ice sheets.²
- Changes in weather that include widespread changes in precipitation, ocean salinity, and wind patterns, and more energetic and aspects of extreme weather, including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones.³
- Decline of Sierra snowpack, which accounts for approximately half of the surface water storage in California, by 70 percent to as much as 90 percent over the next 100 years.⁴

¹ RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

² Ibid.

³ Ibid.

⁴ RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

- Increase in the number of days conducive to ozone formation by 25–85 percent (depending on the future temperature scenario) in high ozone areas of Los Angeles and the San Joaquin Valley by the end of the 21st century.¹
- High potential for erosion of California’s coastlines and sea water intrusion into the Delta and levee systems due to the rise in sea level.²

The following climate change effects could affect the proposed I-5 HOV Lane Extension Project. However, the type and degree of the impacts that climate change would have on humans and the environment is difficult to predict at the local scale.

- **Sea Level Rise:** According to the IPCC, climate change is expected to raise sea levels by up to four feet. The project area is at a coastal location, and sea level rise of this magnitude could inundate portions of the local coastline. However, I-5 is elevated within the project limits, which would reduce the potential of inundation from higher sea levels. Additionally, the effects related to sea level rise are speculative at this time. If determined to be a significant threat, protective measures such as levees would likely be installed by regional and local governments to protect urbanized areas.
- **Natural Disasters:** Climate change could result in increased flooding and weather-related disasters. The southern portion of the proposed project is located within one mile of the Pacific Ocean and may be exposed to intense coastal storms. However, because the proposed project is a freeway, it would not be expected to sustain significant damage. The frequency of large floods on rivers and streams could also increase, which could affect the northern portion of the alignment near San Juan Creek. A portion of the project site is located adjacent to the 100-year flood zone, which could be flooded more frequently if the frequency of large storms increased. However, the proposed project does not include habitable structures and would not impede flood flows; thus, flood-related impacts would be less than significant even under an intensified flooding scenario.

¹ Ibid.

² Ibid.

- **Air Quality:** Climate change would compound negative air quality impacts in the South Coast Air Basin, resulting in respiratory health impacts.¹ However, this would be a regional, not a project-specific effect. Moreover, as discussed above, the project's impacts on air quality were found to be less than significant.

Other predicted physical and environmental impacts associated with climate change include heat waves, alteration of disease vectors, biome shifts, impacts on agriculture and the food supply, reduced reliability in the water supply, and strain on the existing capacity of sanitation and water-treatment facilities. While these issues are a concern for society at large, none of these impacts would have a disproportionate effect on implementation of the proposed project.

Summary

The proposed project is a transportation infrastructure project that would improve the circulation system for vehicular traffic in the project vicinity; reduce congestion, delay, and associated pollutant emissions; and improve air quality in the area. As shown in Table 2.22-2, the proposed project would increase VMT within the HOV lanes, while the freeways, toll roads, ramps, and arterials would experience a VMT decrease. As a result, [Alternative 4 with Design Option A](#) would result in a reduction in VHT and the improved traffic flow, thereby reducing GHG emissions. The improvement in operations compared to the No Build conditions, particularly higher speeds and reduced VHT, has a beneficial impact on CO₂ emissions, which is consistent with the results for the analysis of the other criteria pollutants. The proposed project would result in a positive effect on the reduction of CO₂ levels. Furthermore, AB 1493 (requirement for further improvement in CO₂ emissions from motor vehicles beginning in the 2009 model year) has not yet been incorporated by CARB into the EMFAC model. It is expected that future CO₂ levels would be lower than currently projected in Table 2.22-3 with implementation of AB 1493.

Additionally, the proposed project is programmed in the RTP (ID 2H01143) and the FTIP (2H01143) and is therefore recognized as an improvement project that would improve transportation operations in the region. The proposed HOV lane extension would provide continuity of the I-5 mainline HOV network and maximize overall performance within the project limits. Extending the HOV lane would maintain

¹ RBF Consulting, Air Quality Assessment Interstate 5 HOV Lane Extension Project, May 2010.

travel speeds and minimize weaving conflicts that occur at the termini of the HOV lanes. The 2008 RTP includes programs, policies, and measures to address air emissions, including GHGs. Measures that help mitigate air emissions, including GHG emissions, are comprised of strategies that reduce congestion, increase access to public transportation, improve air quality, and enhance coordination between land use and transportation decisions. SCAG's vision includes the introduction of a high-speed, high-performance regional transport system that may potentially reduce freeway congestion and provide an alternative to the single-occupancy automobile.

This page intentionally left blank